

# MERIT BADGE SERIES



# RADIO



BOY SCOUTS OF AMERICA®



STEM-Based

BOY SCOUTS OF AMERICA  
MERIT BADGE SERIES

# RADIO



*"Enhancing our youths' competitive edge through merit badges"*



BOY SCOUTS OF AMERICA®

# Requirements

1. Explain what radio is. Then discuss the following:
  - a. The differences between broadcast radio and hobby radio
  - b. The differences between broadcasting and two-way communications
  - c. Radio station call signs and how they are used in broadcast radio and amateur radio
  - d. The phonetic alphabet and how it is used to communicate clearly
2. Do the following:
  - a. Sketch a diagram showing how radio waves travel locally and around the world. Explain how the broadcast radio stations WWV and WWVH can be used to help determine what you will hear when you listen to a shortwave radio.
  - b. Explain the difference between a DX and a local station. Discuss what the Federal Communications Commission (FCC) does and how it is different from the International Telecommunication Union.
3. Do the following:
  - a. Draw a chart of the electromagnetic spectrum covering 100 kilohertz (kHz) to 1,000 megahertz (MHz).
  - b. Label the MF, HF, VHF, UHF, and microwave portions of the spectrum on your diagram.
  - c. Locate on your chart at least eight radio services, such as AM and FM commercial broadcast, citizens band (CB), television, amateur radio (at least four amateur radio bands), and public service (police and fire).

4. Explain how radio waves carry information. Include in your explanation: transceiver, transmitter, receiver, amplifier, and antenna.
5. Do the following:
  - a. Explain the differences between a block diagram and a schematic diagram.
  - b. Draw a block diagram for a radio station that includes a transceiver, amplifier, microphone, antenna, and feed line.
  - c. Explain the differences between an open circuit, a closed circuit, and a short circuit.
  - d. Draw eight schematic symbols. Explain what three of the represented parts do. Find three electrical components to match to three of these symbols.
6. Explain the safety precautions for working with radio gear, including the concept of grounding for direct current circuits, power outlets, and antenna systems.
7. Visit a radio installation (an amateur radio station, broadcast station, or public service communications center, for example) approved in advance by your counselor. Discuss what types of equipment you saw in use, how it was used, what types of licenses are required to operate and maintain the equipment, and the purpose of the station.



8. Find out about three career opportunities in radio. Pick one and find out the education, training, and experience required for this profession. Discuss this with your counselor, and explain why this profession might interest you.

9. Do ONE of the following (a OR b OR c):

a. AMATEUR RADIO

(1) Tell why the FCC has an amateur radio service.

Describe some of the activities that amateur radio operators can do on the air, once they have earned an amateur radio license.

(2) Using proper call signs, Q signals, and abbreviations, carry on a 10-minute real or simulated amateur radio contact using voice, Morse code, or digital mode. (Licensed amateur radio operators may substitute five QSL cards as evidence of contacts with amateur radio operators from at least three different call districts.) Properly log the real or simulated ham radio contact and record the signal report.

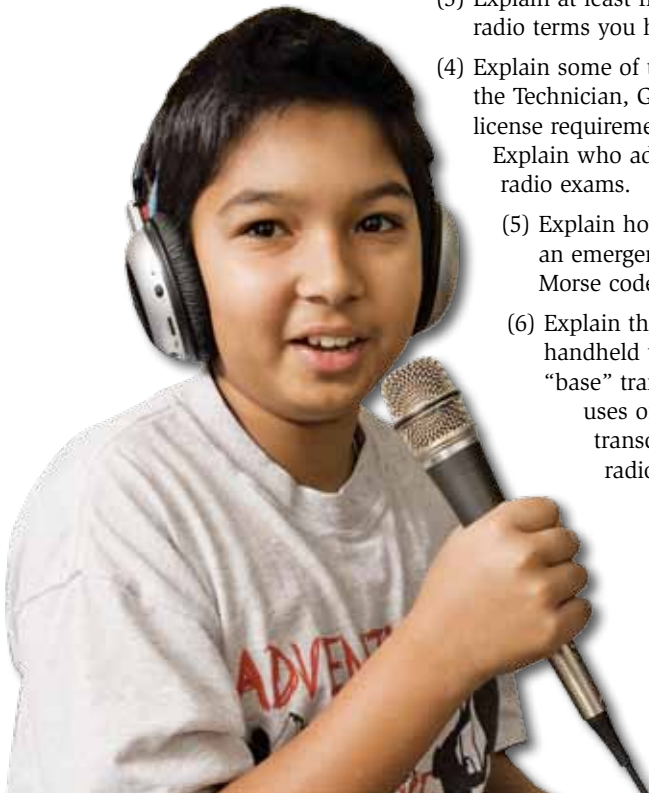
(3) Explain at least five Q signals or amateur radio terms you hear while listening.

(4) Explain some of the differences between the Technician, General, and Extra Class license requirements and privileges.

Explain who administers amateur radio exams.

(5) Explain how you would make an emergency call on voice or Morse code.

(6) Explain the differences between handheld transceivers and home "base" transceivers. Explain the uses of mobile amateur radio transceivers and amateur radio repeaters.



# ON AIR

## b. BROADCAST RADIO

- (1) Prepare a program schedule for radio station “KBSA” of exactly one-half hour, including music, news, commercials, and proper station identification. Record your program on audiotape or in a digital audio format, using proper techniques.
- (2) Listen to and properly log 15 broadcast stations. Determine the program format and target audience for five of these stations.
- (3) Explain at least eight terms used in commercial broadcasting, such as segue, cut, fade, continuity, remote, Emergency Alert System, network, cue, dead air, PSA, and playlist.

## c. SHORTWAVE LISTENING

- (1) Listen across several shortwave bands for four one-hour periods—at least one period during daylight hours and at least one period at night. Log the stations properly and locate them geographically on a globe.
- (2) For several major foreign stations (BBC in Great Britain or HCJB in Ecuador, for example), list several frequency bands used by each.
- (3) Compare your daytime and nighttime logs; note the frequencies on which your selected stations were loudest during each session. Explain differences in the signal strength from one period to the next.

# Radio Resources

## Scouting Literature

*Computers, Electricity, Electronics, Emergency Preparedness, Energy, Robotics, and Search and Rescue* merit badge pamphlets

Visit the Boy Scouts of America's official retail website (with your parent's permission) at <http://www.scoutstuff.org> for a complete listing of all merit badge pamphlets and other helpful Scouting materials and supplies.

## Books and Other Resources

Many of the books, CDs, and other resources listed here are available from the American Radio Relay League. See page 96 for contact information.

## AMATEUR RADIO

Alvareztorres, Al, AA1DO, and Ed Hare, WIRFI, compilers. *Ham Radio FAQ*. American Radio Relay League Inc., 2001. Answers to frequently asked questions about antennas, station setup and operation, and other issues.

*Amateur Radio Today*. ARRL Inc., 2003. Six-minute video narrated by former CBS news anchor Walter Cronkite, KB2GSD; showcases the public service contributions made by hams.

*The ARRL Emergency Communication Handbook*. ARRL Inc., 2005. For hams who want to help with communications during emergencies or disasters.

*The ARRL Ham Radio License Manual*. ARRL Inc., 2010. A beginners' guide to amateur radio and preparation for the ham radio license test.

Barasch, Lynne. *Radio Rescue*. Farrar, Straus and Giroux, 2000. The story of a young amateur radio operator whose skills led to the rescue of a family stranded by a hurricane.

*Basic Technology for the Amateur Radio Enthusiast*. Alpha Delta Communications Inc., 2000. Basic electronics, a brief history of radio, and a virtual tour through a receiver. Includes book with 23-minute VHS videotape.

*Getting Started With Ham Radio.* ARRL Inc., 2006. A guide to your first amateur radio station: choosing and installing equipment, making your first voice contacts, setting up for digital operating, operating on various bands and modes, etc.

Hallas, Joel, W1ZR. *Basic Radio: Understanding the Key Building Blocks.* ARRL Inc., 2005. An introduction to radio with simple, build-it-yourself projects.

Silver, H. Ward. *Ham Radio for Dummies*, 2nd ed. John Wiley & Sons, 2013.

*Understanding Basic Electronics.* ARRL Inc., 2010. Simple guide for electronics beginners with explanations of basic electronics principles and how components work.

*Your Introduction to Morse Code.* ARRL Inc., 2006. Morse code instruction and practice for those who want to learn the “universal language” of ham radio. Includes two audio CDs and instruction booklet.

## **BROADCAST RADIO AND SHORTWAVE LISTENING**

Bureau of Labor Statistics, U.S. Department of Labor. *Occupation Outlook Handbook, 2012–13 ed.* See “Media and Communication,” online at <http://www.bls.gov/ooh/home.htm>.

Field, Shelly. *Career Opportunities in Radio.* Checkmark Books, 2004. Profiles of more than 70 career opportunities in the radio business.

*World Radio TV Handbook: The Directory of Global Broadcasting.* WRTH Publications. Published annually, a guide to the world of radio including domestic radio services and broadcasters transmitting internationally.

## **Acknowledgments**

The Boy Scouts of America is grateful to the following for their work on this revision of the *Radio* merit badge pamphlet: In particular, Mike Brown, WB2JWD, Harford, New York, who coordinated the overall revision; Bill Burns, WA6QYR, Ridgecrest, California; Allan Koch, KA8JNN, Clinton Township, Michigan; and Larry Wolfgang WR1B, Newington, Connecticut, for contributing to the “Amateur Radio” section and related portions of the pamphlet. Thanks to Donald L. Perkins, N2IVW, operations manager and engineer, Central New York Radio Group, for his help in revising the “Broadcast Radio” section of the pamphlet.

The BSA thanks the staff and volunteers of the American Radio Relay League for many contributions over the years, and for those materials reprinted with the permission of the ARRL from its publications and website.